

yards/hour, approximately 11 cubic yards of silt will be discharged into the channel each hour. The silt will mix with the incoming and outgoing tidal flows, which will tend to dilute the concentration of silt in the water column. The level of silt concentration throughout the tidal cycle was determined for each 0.125 hour time increment (time increment used in the numerical model) by dividing the volume of silt introduced into the channel over this time interval by the average discharge in the channel over that same time interval. The resulting silt concentrations over a typical tidal cycle are shown on Figure 6.8 and averaged around 6 ppm (parts per million) during flood and 4 ppm during ebb with some peak concentrations occurring near the times of slack water. Note that these peak concentrations would be located in the vicinity of the discharge pipe and would not affect the entire area of the sediment plumes indicated on Figure 6.1. The predicted levels of suspended sediment outside the immediate disposal area are probably within the measurement error and would be difficult to detect above normal background levels.

6.10. Turbidity. Suspended sediment is not directly correlated to turbidity as suspended sediment concentrations is a physical measure of the sediment volume in a unit volume of water while turbidity is a

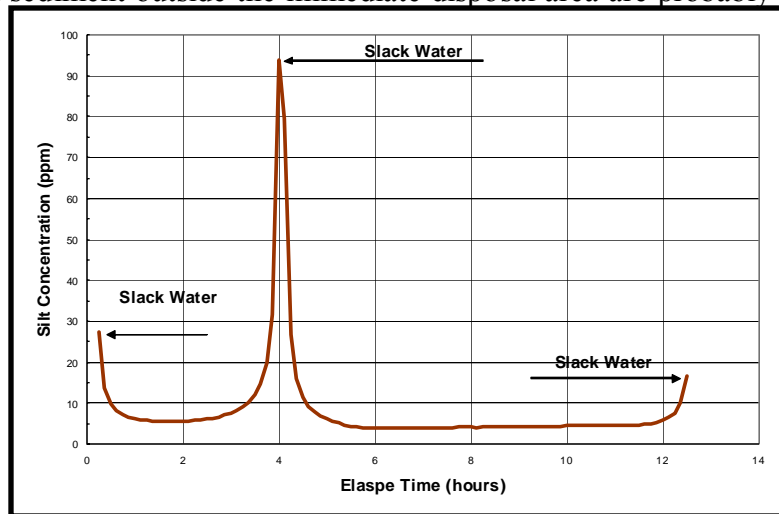


Figure 6.8 Silt Concentrations at the Point of Discharge During Dike Construction

measure of the ability of light to penetrate into the water column. While turbidity is obviously affected by the suspended sediment load, other factors such as the color of the water will affect turbidity readings. Given the low levels of increased suspended sediment loads expected during the construction of the dike, this activity is not expected to produce turbidities that exceed the State of North Carolina's water quality standards.

6.11. Sheet pile Wall or Other Temporary Barrier. Consideration had been given to possibly using a sheet pile wall or some other type of structural barrier to reduce the flow in the existing channel to facilitate its closure. Any structure used for this purpose would have been removed once the channel was completely closed. However, based on the successful closure of the channel adjacent to Hilton Head, South Carolina, and the predictions made for closure of the Bogue Inlet channel by simply pumping dredge material directly into the channel, there is not an engineering requirement for the structural barrier. Also, the use of a structural barrier would add significant costs to the project both directly, for its construction and removal, but more importantly, indirectly, as the dredge would have to standby until construction of the structural barrier was complete. The only other reason to use a structural barrier would be to control sedimentation associated with the transport of the finer fraction of the dredged material

outside of the dike area, particularly into the sounds and adjacent wetlands. Again, based on the relatively low silt content of the material to be dredged to reposition the ebb channel and close the existing channel, and the low concentrations expected beyond the immediate disposal point, the environment impacts associated with the dike construction seem to be minimal.

7.0 OTHER ALTERNATIVES

7.1. Introduction. In addition to the no action alternative, which is addressed in Section 8 of this report, alternatives to the channel relocation project considered include:

- a. Stabilization of the Pointe Shoreline with a permanent hard structure (Alternative H in the EIS).
- b. Suspension of the Corps of Engineers channel maintenance activities in the existing channel (Alternative D in the EIS).
- c. Channel relocation without beach nourishment (Alternative E in the EIS).
- d. Long-term Inlet Sand Management Strategies (Alternative H in the EIS).

A brief discussion of each of these alternatives follows.

7.2. Hard Structure. The use of hard structures such as groins, jetties, and/or revetments to protect the Pointe shoreline is not a reasonable or feasible alternative given the State of North Carolina's coastal management regulations and recently enacted State Law that prohibits such structures. Accordingly, details of this alternative were not developed.

7.3. Suspension of Corps of Engineers Channel Maintenance. The Corps of Engineers has been using shallow draft sidecast dredges to maintain the authorized 8-foot mlw by 150-foot wide channel since 1981. During each maintenance operation, the Corps' dredging activities is restricted to deepwater channel that exist at the time. As a result, the maintenance dredging does not maintain a fixed channel alignment and the channel has continually migrated to the east during the entire maintenance dredging period. While there may be some reason to suspect that the maintenance dredging has facilitated or accelerated the eastward migration of the channel, the sidecast dredging effort has historically been unsuccessful in maintaining the 8-foot channel depth for any significant period of time. This was noted in the analysis of the 16-month period in which the sidecast dredges reportedly removed 357,800 cubic yards from the channel yet controlling depths during this period were generally less than 6.5 feet mlw. If channel maintenance was suspended in hopes that a new channel would breach through the middle of the channel, there is nothing in the historic record of the inlet's evolution that suggest this would occur. A new channel will likely breach through the middle of the inlet at some time in the future with or without maintenance. However, given the immediacy of the erosion problem at the Pointe, waiting for the channel to naturally reposition itself will result in continued erosion and damage to the development and infrastructure at the Pointe. Therefore, suspension of the maintenance dredging activities

would not reduce or eliminate the existing erosion threat and is therefore not a reasonable alternative.

7.4. Channel Relocation without Beach Nourishment. In the interest of rapidly reestablishing the lost intertidal habitat that will accompany the repositioning of the inlet channel, consideration was given to stockpiling the dredged material during the channel relocation and transferring the stockpiled material into the existing channel once the channel is completed. This alternative would also include the construction of a sand dike across the existing channel. Areas where the dredged material could be stockpiled include the existing Bogue Banks sand spit and the shoal area located between the new channel and the existing channel. The available dry land area on the spit totals about 900,000 square feet. Stockpiling 850,000 cubic yards in this area would result in a mound approximately 30 feet high. Stockpiling the material in the shoal area would create some additional problems with material being transported out of the stockpile area by tidal currents. This could possibly be overcome with the construction of a temporary sandbag dike around the stockpile area, but this would add substantially to the cost of the project. The area that could be used to stockpile the material has a surface area of approximately 2,000,000 square feet. Stockpiling 850,000 cubic yards in this area would create a mound approximately 15 feet high. The material could be stockpiled using a combination of the spit area and shoal area, which would reduce the height of the stockpile to around 10 feet.

7.5. This alternative would result in substantial damage to the habitat on the existing sand spit and the intertidal shoals which would offset any accelerated recovery of the intertidal habitat loss as a result of the channel relocation. In this regard, the amount of intertidal shoals that would be disturbed by the relocation of the channel will range between 2.8 million square feet (64 acres) to around 3.1 million square feet (71 acres) depending on the final design of the channel. Also, the need for beach nourishment material would still exist for the west end of Emerald Isle resulting in the Town of Emerald Isle using the offshore borrow area for this segment of their beach nourishment project. Accordingly, channel relocation without beach nourishment is not a reasonable alternative to the proposed channel relocation/beach nourishment project.

7.6 Inlet Sand Management. The only effective way to permanently control the location of the inlet channel is through a dedicated program of channel maintenance with the material removed from the channel distributed to the adjacent islands. However, the existing 8-foot mlw authorized depth for the inlet channel would not allow ocean certified pipeline dredges (the type of plant necessary to accomplish the work) to routinely maintain the channel given the minimum digging depths of these type dredges is 12 feet. Increasing the authorized depth in Bogue Inlet would require detailed studies by the COE and Congressional authorization for the channel improvements. The process for obtaining approval for a deeper channel would take several years with the timeline beginning once Congress authorizes the COE to conduct a study. Such a study has not been authorized nor is authority for such a study being pursued. Given the immediacy of the erosion threat to development at the Pointe, waiting to gain approval for a deeper

channel and associated sediment management is not an option that would address the present needs of the Town of Emerald Isle.

7.7. The COE is conducting a feasibility study for long-term storm damage reduction for all of Bogue Banks and will consider Bogue Inlet as a possible source of beach nourishment material for portions of the island's shoreline. If the COE elects to use Bogue Inlet as a source of beach nourishment material and concentrates its activities along the channel corridor, the position of the channel could be stabilized. Any consideration of the inlet as a source of beach nourishment material will have to include sand management strategies that will distribute material to both Bogue Banks and Bear Island (Hammocks Beach State Park). The COE is not scheduled to complete the feasibility study for at least 2 more years with construction delayed for several more years while final plans are prepared and all of the necessary requirements of local cooperation satisfied. Accordingly, the Bogue Banks storm damage reduction project may offer some means to maintain the position of the Bogue Inlet channel in the future but will not be done in time to provide any immediate relief for the Pointe.

8.0 SEDIMENT REDISTRIBUTION

8.1. The repositioning of the main ebb channel through Bogue Inlet to a more central position between Bogue Banks and Bear Island will result in the redistribution of a rather large volume of sediment either through the direct actions associated with the channel

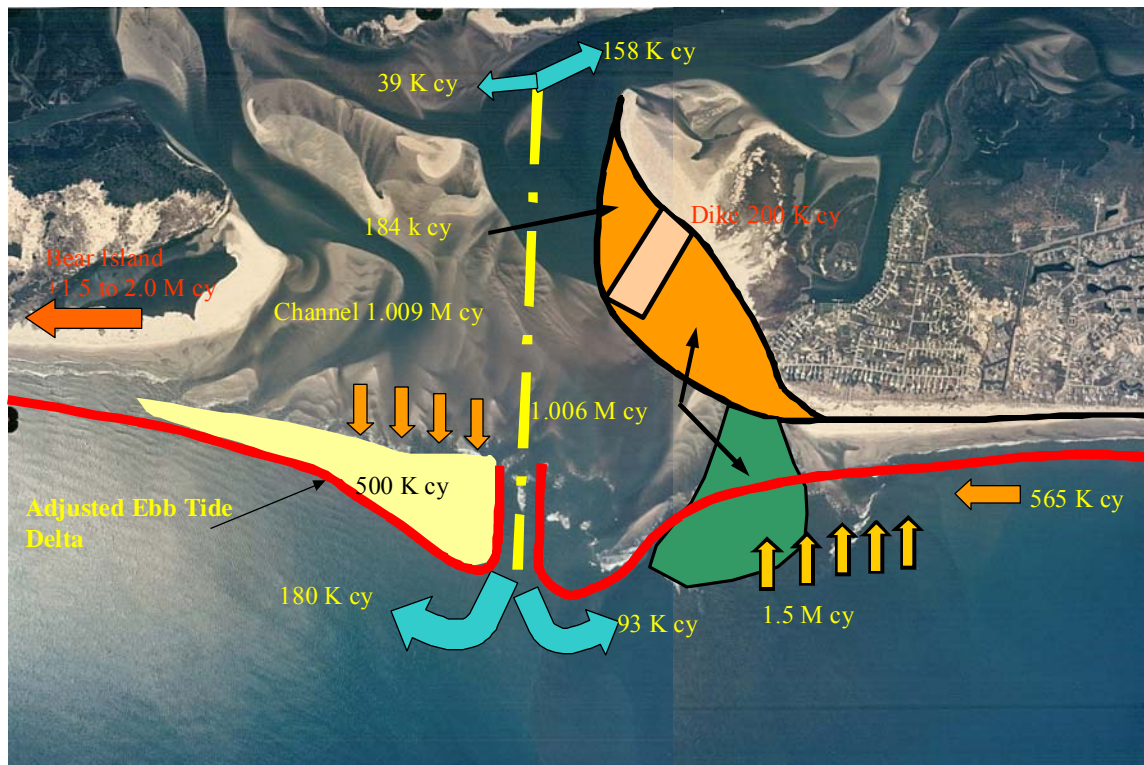


Figure 8.1 Sediment Redistribution following Channel Relocation

relocation and dike construction or indirectly through sediment transport process driven by tidal currents and wave action. A summary of the sediment redistribution expected to accompany the construction of the 13.5-ft NGVD x 500 ft channel is shown schematically on Figure 8.1. Also shown on Figure 8.1 are the projected shorelines on the east end of Bear Island and the west end of Bogue Banks and a general outline of the reconfigured ebb tide delta. Again, the major changes in the sediment distribution will occur on the west end of Bogue Banks with the onshore movement of roughly 1.5 million cubic yards of ebb tide delta material, the transport of 565,000 cubic yards of material off the west end of Bogue Banks toward Bogue Inlet, the redevelopment of the sand spit west of the present Pointe shoreline, and the infilling of the abandoned ebb tide channel. Approximately 490,000 cubic yards of material would be scoured from the sides of the new channel as it adjust to the new flow regime with 197,000 cubic yards of the scoured material predicted to be transported toward the sound and 273,000 cubic yards transported seaward. The scour adjustments of the new channel will occur over a relatively short period of time and should be completed within a period of 4 months. The buildup of the ebb tide delta west of the repositioned channel would require approximately 500,000 cubic yards of material with some of this volume derived from the material scoured from the new channel. A large portion of the ebb tide delta material will come from the redistribution of the material presently residing on the expansive middle ground shoal located west of the existing channel. As discussed in the geomorphic analysis section, the middle ground shoal of Bogue Inlet has apparently been building in elevation as a result of the present delta configuration that allows swash bars to move directly into the area. With the channel located in a more central location, this stored material will be pushed seaward and reshaped by the new wave refraction patterns associated with the repositioned channel. Finally, the predicted accretion on Bear Island will result in the retention of 1.5 to 2.0 million cubic yards of material that would, under existing conditions, have been transported into and retained by the inlet system.

9.0 WITHOUT PROJECT ALTERNATIVES

9.1. Introduction. The rate of erosion of the inlet shoreline at the Pointe has varied in response to varying rates of channel movement. The cumulative movement of the Emerald Isle inlet shoreline between December 1973 and September 2001 is plotted on Figure 9.1. As shown on Figure 9.1, the easterly migration of the inlet shoreline began in February 1984 and continues today. Two

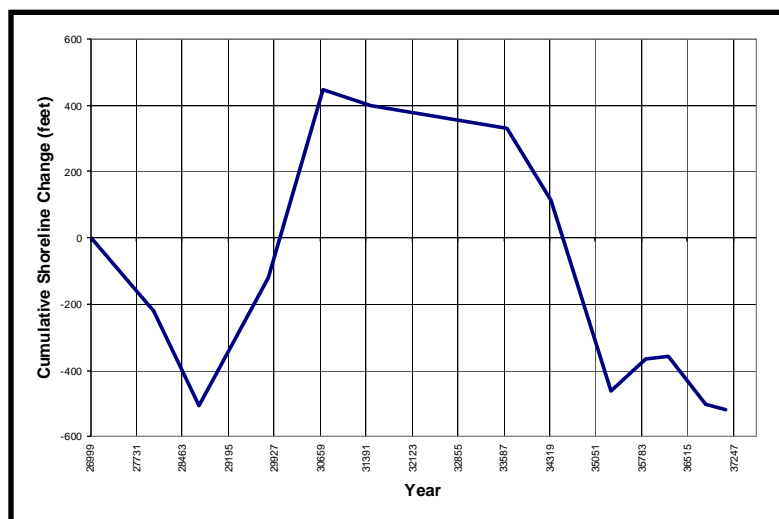


Figure 9.1 Cumulative Changes in the Emerald Isle Inlet Shoreline (Dec 1973 to Sep 2001)

periods since 1984 to the present were evaluated to obtain a range of possible inlet shoreline migration rates. Between February 1984 and September 2001, the linear regression trend through the data resulted in a migration rate of 62.0 feet/year (Figure 9.2). A second linear regression trend was constructed for this time period by excluding the September 1996 shoreline position that had been strongly influenced by Hurricane Fran. The slope of this trend line, excluding the September 1996, position was slightly less, equaling 60.4 feet/year (Figure 9.2). The second period evaluated was from February 1992 to September 2001, a period when the easterly migration of the shoreline seemed to accelerate. Over this time period, the linear trend of the data resulted in an inlet shoreline erosion rate of 87.5 feet/year with the September 1996 shoreline position included (Figure 9.2) versus 91.3 feet/year with the September 1996 position excluded (Figure 9.2). Even though the inlet shoreline has experienced a range of shoreline changes from around 60 feet/year to 90 feet/year since the mid 1980's, the evaluation of the without project impacts on the economy of Emerald Isle and Carteret County was based on the continuation of an erosion rate of 60 feet/year for at least the next 10 years.

9.2. Three alternatives were evaluated for the without project condition. The first alternative (Alternative A – No Action) assumed that the inlet shoreline would continue to migrate at a rate of 60 feet/year to the east over a period of 10 years. Under this alternative, a structure would be lost to erosion once the inlet shoreline reaches its foundation. When this occurs, the structure would be abandoned and demolished by its owner. The second alternative (Alternative B – Relocate Homes) assumes that once a structure becomes threatened, the property owner would elect to relocate the building to some other location within the town limits of Emerald Isle. The inlet shoreline erosion rate used to evaluate this alternative was the same as the Alternative A. The third alternative (Alternative C – Sandbag Revetments) assumed that sandbag revetments would be constructed to protect buildings and roads once they become threatened. In this regard, the State of North Carolina considers a structure to be threatened once the erosion encroaches within 20 feet of its foundation. In the case of a road, the threatened status begins when erosion reaches the road right-of-way. State rules allow temporary sandbags protecting buildings to remain in place for a period of 2 years after which they must be removed. Sandbag structures constructed to protect roads are allowed to remain in place for 5 years after which they too must be removed. In practice, the State has granted some extensions of the 2-year and 5-year rules, particularly if a long-term protection plan is being formulated. However, for the without project analysis, the assumption was made that no long-term plans are being considered and that the sandbags must be removed at the end of their permit period. All three alternatives assumed that the existing sandbag revetments protecting the Pointe shoreline, which have essentially reached the end of their permit periods, would be removed at the beginning of the analysis.

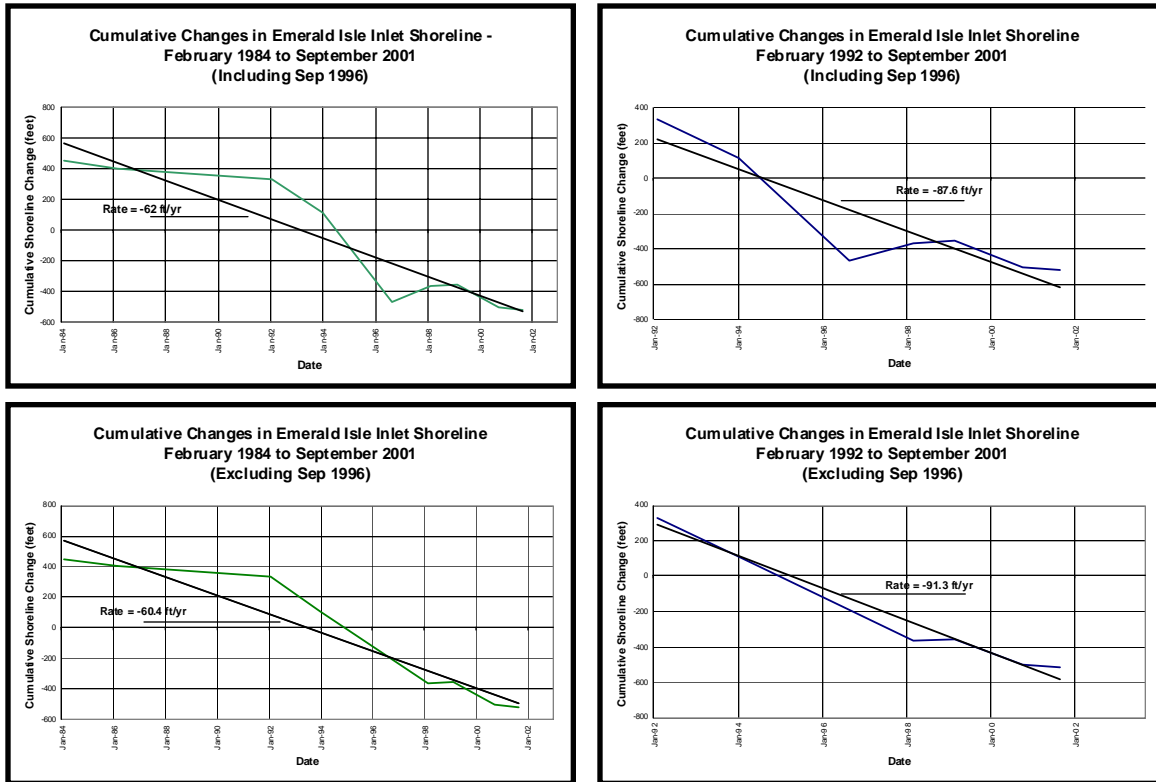


Figure 9.2 Emerald Isle Inlet Shoreline Change Rates